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CANADIAN PATENT

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SKIN TREATING APPLIANCE

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No. OF CLAIMS

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972244

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A hand held motor operated appliance comprising an elongated implement supporting lever, a motor drivingly interconnected with said lever to actuate said lever with respect to a supporting bearing, means supporting said bearing for limited rectilinear movement in a direction perpendicular to the length of said lever, switch means connected in circuit with said motor and positioned to be actuated by said means supporting said bearing, resilient means biasing said means supporting said bearing to a position in which said switch is open, said means supporting said bearing being movable to a switch closing position by the application of force to said implement.

2. A hand held motor operated appliance comprising an implement supporting lever, a motor drivingly interconnected with said lever to oscillate said lever about a supporting bearing and to reciprocate said lever axially, a carrier supporting said bearing for limited rectilinear movement in a direction perpendicular to the plane of oscillation of said lever, switch means connected in circuit with said motor and positioned to be actuated by said carrier, spring means biasing said carrier to a position in which said switch is open, said carrier being movable to a switch closing position by the application of force to said implement.

3. The appliance of claim 2 including a housing supporting and enclosing said motor and carrier, an implement detachably supported on said lever, a lever immobilizing means for holding said lever against deflecting said carrier to a switch closing position during the assembly and disassembly of said implement to and from said lever.

4. The appliance of claim 3 wherein said lever immobilizing means comprises a member extending through said housing and providing exposed portions which may be utilized to push the member to either of

two positions, in one of said positions said lever is unrestrained while in the other position said lever is restrained against deflecting said carrier to a switch closing position.

5. The appliance of claim 4 wherein said member is provided with detent means to retain said member in either one or the other of said positions, said lever being operable to move said member from said other position to said one position when sufficient force is applied to said implement to overcome said detent means.



This is a divisional application of Canadian Serial No. 139, 378, filed April 11, 1972.

In our present affluent society, a vast amount of money is spent on cosmetics and means for maintaining or preserving the beauty and the condition of a person's complexion. Although expensive creams and lotions have long been available for skin treatment, there have been no appliances which have been specifically developed for the skin or complexion care. Various types of pads and cloths have been used by women to apply soaps and lotions to their skin by hand. Because of the absence of any suitable equipment, many women simply apply soaps and lotions to their face and body using their hands or fingertips. Such an approach represents an unsatisfactory solution to the skin care problem since it is difficult for women of ordinary dexterity to apply soaps and lotions evenly and uniformly using the fingertips or some sort of pad or cloth.

With the development of small, efficient, permanent magnet motors, it has been possible to produce compact, portable appliances suitable for many purposes. Through the utilization of the recently developed nickel cadmium rechargeable batteries, it has been possible to provide such small appliances which may be used safely for personal grooming and under conditions in which they may be subjected to water or other liquids. An outstanding example of one such appliance is the rechargeable battery operated electrical toothbrush which is in widespread use at the present time. Even as the toothbrush permits the user to perform a quicker and better cleaning job on the teeth, so a similar appliance is required to enable women to perform a better and more complete cleaning and treatment of their skin.

Summary of the Invention

The invention relates to an electrically operated skin treating appliance having a rechargeable battery operated motor enclosed within a power handle which is arranged to drive a skin treating brush or



massaging instrument through an elliptical orbit in a single plane. The motor is arranged at one end of the power handle and is drivingly related to a pivotally mounted lever which extends from the other end of the power handle. The portion of the drive lever between the motor and the pivot straddles the rechargeable battery, and the housing of the power handle extends beyond the pivoted mounting to substantially enclose the implement mounting end of the lever.

10 The switch for operating the motor is arranged to be actuated when a lateral pressure is applied to the implement supporting shaft or lever. This actuation is accomplished by means of supporting the lever or shaft bearing in a spring biased carrier which may be moved between a switch open and a switch closing position when the aforementioned lateral of force is applied to the end of the implement supporting shaft.

As a means of avoiding actuation of the switch when skin treating implements are applied to or removed from the shaft, a simple button having a shaft restraining portion is provided in the housing. This button permits the shaft to be restrained against displacement during the time in which brushes or massage heads are applied to the appliance. This button is such that it may be displaced to the inoperative position simply
20 by applying a substantial force to the skin treating implement or by moving the button by hand to a non-restraining position.

The skin treating implement itself is provided with a skirt which cooperates with a flange on the housing or power handle extension in a manner to limit or restrict the accumulation of dirt or other deposits in the unsealed portions of the appliance. The appliance itself is completely sealed to provide a liquid tight enclosure for the motor and battery. Re-charging is accomplished by means of induction charging with the secondary portion of the transformer being sealed within the power handle. The treating implements for use with the appliance consist of brushes

having soft bristles as well as a novel massage or skin conditioning instrument which includes a freezable liquid enclosed within a blow molded polyethylene envelope. The polyethylene envelope is provided with a smooth aluminum facing member which improves heat transfer between the face and the frozen liquid contained within the envelope. This attachment may also be held under the hot water faucet for storing heat and using as a heated massager.

An object of the present invention is to provide an improved electrically operated skin treating appliance.

10 A further object of the present invention is to provide an improved complexion care appliance having a rechargeable battery operated mechanism which produces an orbital motion in a skin treating implement.

Another object of the present invention is to provide a complexion care appliance having improved switching means whereby the motor is operated by switch means controlled in response to the application of force to the skin treating implement.

20 Still another object of the present invention is to provide an improved complexion treating appliance having automatically operated switch means controlled by force on the skin treating implement with means included for rendering the switch inoperative during the attachment and removal of implements from the appliance.

An additional object of the present invention is to provide an improved power handle for a skin treating appliance wherein improved orbital motion is obtained in the output of the power handle by means of an elongated drive lever which straddles the battery within the power handle and is pivoted in a bearing which also adapts the lever for axial movement.

30 Further objects of the present invention will become apparent as the following specification proceeds and the features of novelty which

characterize the invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

Brief Description of the Drawings

For a better understanding of the present invention reference may be had to the accompanying drawings in which:

Fig. 1 is a perspective view of a new and improved electrically operated skin treating appliance embodying the principles of the present invention;

Fig. 2 is a vertical sectional view taken substantially through the vertical axis of the power handle of the appliance shown in Fig. 1;

Fig. 3 is an exploded perspective view of the internal mechanism of the appliance shown in Figs. 1 and 2;

Fig. 4 is an enlarged fragmentary sectional view of the drive mechanism which is also shown in Fig. 2;

Fig. 5 is a sectional view taken substantially on line 5-5 of Fig. 4;

Fig. 6 is an enlarged sectional view taken on line 6-6 of Fig. 4;

Fig. 7 is a fragmentary sectional view taken on line 7-7 of Fig. 6;

Fig. 8 is a fragmentary sectional view taken on line 8-8 of Fig. 6;

Fig. 9 is a fragmentary sectional view taken on line 9-9 of Fig. 6;

Fig. 10 is an enlarged sectional view taken substantially along line 10-10 of Fig. 1;

Fig. 11 is a sectional view similar to Fig. 10 but with the control button shown in the off position;

Fig. 12 is a fragmentary sectional view taken on line 12-12 of Fig. 11 assuming that Fig. 11 shows the complete housing;

Fig. 13 is a fragmentary vertical elevational view of the appliance shown in Fig. 1 with portions of the charging stand and the power

handle shown in section for the purposes of illustration;

Fig. 14 is a schematic diagram of the electrical circuit in the power handle and the charging stand;

Fig. 15 is an enlarged fragmentary view taken on line 15-15 of Fig. 3; and

Fig. 16 is a sectional view of an alternative embodiment of the face and skin treating implement.

Description of the Preferred Embodiment

There is shown in Fig. 1 of the drawings an electrically operated skin treating appliance designated generally by reference numeral 20. The appliance 20 includes a power handle 22, a charging stand 24, and at least one detachable skin treating implement 26. The skin treating implement 26 is provided with a brush back or bristle supporting head 28 from which a plurality of tufts or bristles 30 extend. The brush or implement 26 is designed to be moved in one plane in a substantially elliptical orbit by means of the mechanism to be described below which is included in the power handle 22. The bristles 30 are made of soft, synthetic fibers so that they may be safely used in connection with skin treatment without the danger of any irritation. The brush 26 is made in a configuration having an elliptical outline with the long dimension being about twice the shorter dimension. It has been found that such a brush configuration provides the maximum convenience for cleaning the various areas and contours of the face, neck, etc. The brush is caused to move in an elliptical orbit in which the dimension of the orbit parallel to the long dimension of the brush is approximately 3/16 of an inch while the size of the orbit parallel to the short dimension of the brush is approximately 1/8 of an inch. Thus, the orbit through which the brush is moved is substantially similar to the elliptical shape of the brush itself. For the purpose of illustration, a dotted line showing of the shape of the orbit is included in Fig. 1.

In order to provide a satisfactory power handle for producing the orbital motion of the treating implement 26, it is necessary to arrange the implement drive means so that the reaction to the motion producing means will not cause the power handle 22 to oscillate rather than the implement 26. This result requires a particular design of the power transmitting shaft and arrangement of the driving elements as will be more specifically described below.

The power handle 22 as best shown in Fig. 2 includes an elongated housing 32 which is formed by a generally cylindrical tapered member 34 and a cup-shaped cap member 36. The housing member 34 is provided with a stepped flange 34a which cooperates with a flange 36a on the cap member 36 at their abutting edges to form an overlapping connection. A suitable cement or adhesive is applied in this area to seal the members 34 and 36 together in this area.

Within the sealed portion of the housing 32 is a rechargeable battery 38 and a low voltage direct current operated motor 40 which is adapted to operate from the battery 38. In order to visualize the manner in which the motor 40 and the battery 38 are interrelated, reference should be had to Figs. 3, 4, and 5 of the drawings. The motor 40 includes a cup-shaped housing 42 which is closed by means of a gear supporting frame 44. Joined to the gear supporting frame 44 and extending outwardly therefrom is a channel-shaped battery support 46 which at its outer end is joined to a forward bearing support 48. Battery support 46 is generally semi-cylindrical in shape and partially encloses the battery 38 as is shown in Figs. 3, 4, and 5. The portion of the support 46 extending from the battery enclosing area to the supporting frame 44 includes three legs or struts 46a, 46b, and 46c. The outer legs 46a and 46b are notched at 46d and 46e so that they may be hooked into engagement with projections 44a provided on the frame 44. A third projection 44b shown best in Fig. 4 engages an opening

in the center strut 46c to provide a rigid connection between the battery support 46 and the gear supporting frame 44. The projections 44a and 44c are staked or deformed over the adjacent portions of battery support 46 to increase the rigidity of the assembly.

The gear supporting frame 44 is a die-cast member which is substantially U-shaped having a pair of upwardly extending legs 44c and 44d which support a transversely extending shaft 50. The purpose of the shaft 50 is to support for rotation thereon a gear member 52. The gear member 52 is provided to drivingly connect the output of the motor 40 with an elongated power transmission lever or shaft 54. The motor 40 includes an output shaft 56 on which a spur gear 58 is secured. The gear member 52 is formed with a face gear 52a which is driven by the spur gear 58.

Positioned axially from the face gear 52a on the gear member 52, there are provided two separate cylindrical cams 52b and 52c. These cams 52b and 52c determine the orbit through which the skin treating implement 26 will move when it is connected to the outer end of the power shaft 54.

In order to relate the power shaft 54 with the gear member 52, the end of the lever 54 is provided with a double cam follower 60 which is best shown in Figs. 3, 4, and 5. The interior of the cam follower 60 is provided with a recess within which the cams 52b and 52c extend. Cam follower surfaces 60a and 60b, as best shown in Fig. 15, are rounded, rectangular openings which control the movement of the follower 60 during the rotation of the gear member 52. The interengaging cam and follower portions 52b and 60a control the movement of the lever 54 lengthwise thereof, whereas the cam 52c and follower surface 60b control the lateral movement of the follower 60.

The outermost end of the follower 60 is formed with a guide portion 60c which slides between the projection 44d and a guide wall 44e. The guide 60c in its sliding engagement with the frame 44 assures adequate

support for the inner end of the lever 54 as force or pressure is applied to the skin treating implement 26. The gear member 52 and the co-operating follower 60 are made of a suitable plastic material which will have the necessary bearing qualities for such an application. In one constructed embodiment of the invention, an impregnated, nylon material was used.

The follower 60 is molded into the outer end of the shaft 54 with a clearance opening 60d being provided for the gear shaft 50 to extend there-through.

10 The power transmitting lever or shaft 54 is made up of a forwardly extending rod portion 54a and a formed U-shaped portion 54b. The U-shaped portion 54b extends alongside of the battery 38 and serves to drivingly interconnect the gear member 52 with the rod portion 54a which is axially disposed within the power handle 22. The rod portion 54a is received in a bearing 62 which is positioned on the bearing support 48. In order to retain the bearing support 48 in assembled relationship with the battery support 46, the bearing support 48 is formed with integrally molded flanges 48a and 48b which snugly receive the forward end of the battery support 46 which is the end remote from the motor 40. A third
20 projection 48c on the bearing support 48 engages the interior of the semicylindrical battery support 46 to insure a rigid connection between the parts. The inward projections 48d on the flanges 48a and 48b snap behind projections 46g on the battery support to restrain the bearing support 48 against axial movement with respect to the battery support 46. The manner in which the projections 48a, 48b, and 48c interlock with the battery support 46 is best shown in Figs. 3, 5, and 6. This provides a simple and inexpensive means of assembling the supports 46 and 48 relying simply on the resilience of the battery support 46 to retain the parts against disassembly.

The above described bearing 62 for the lever 54 is mounted on

The purpose of this limited movement is to actuate a switch 74 which is mounted on the inner face of the bearing support 48, as is clearly shown in Figs. 6 and 7. The switch 74 consists of two L-shaped contact members 75 and 76 which are mounted on the bearing support 48 by means of rivets 77 with the free ends of the contact members 75 and 76 extending into an overlapping relationship, as is shown in Fig. 6.

Under normal conditions, when the carrier 64 is in its disengaged position with respect to switch 74, the contact members 75 and 76 are formed and mounted so that their overlapping ends are spaced apart, as shown in Fig. 4. The carrier 64 is biased to this disengaged position by means of a coil spring 78 which is positioned in the slot 67 and supported on axially extending protuberances formed on the bearing support 48 and the carrier 64. As shown in Figs. 4, 6, and 7, the spring 78 biases the carrier 64 downwardly into engagement with the stop member 72. In this position, the contact members 75 and 76 are spaced apart, and the switch 74 is, therefore, in its open position even though the carrier 64 is engaged with the contact member 75. When a force is applied upwardly against the outer or exposed end of the lever 54, as shown in Fig. 7 by an arrow, the carrier 64 is urged upwardly in the slots 67 and 68 overcoming the biasing force of the spring 78.

An actuating projection 79 on the T-shaped extension 66 of the carrier 64 is in continuous engagement with the contact member 75, and when the carrier 64 is urged upwardly, the projection 79 forces contact member 75 upwardly into engagement with the contact member 76. Although not shown in the drawings, suitable leads are provided to interconnect motor 40, battery 38, and switch 74. As shown in the schematic drawing of Fig. 14, the closing of the switch 74 connects the motor 40 in series with the battery 38 causing the motor 40 to operate. It should be evident that the purpose of the switch 74 and the movable carrier 64 is to

provide a means whereby the appliance 20 may be actuated by merely placing the skin treating implement 26 against the face or skin of the user thereby deflecting the shaft 54 as the carrier 64 moves in opposition to the biasing spring 78. The motor 40 will then continue to operate until such time as the appliance 20 is moved away from the skin and there is no longer any force applied to the implement 26. At this point, the biasing spring 78 will again return the carrier 64 to a position in which the contact members 75 and 76 are spaced apart thereby opening the circuit between the battery 38 and the motor 40.

10 In view of the fact that the appliance 20 is used in applying soaps, creams, and other liquids to the skin, it is important that the internal parts including the battery 38 and the motor 40 be sealed against the entrance of moisture. As was indicated above, the cap member 36 is sealed to the tapered cylindrical housing member 34 by a suitable adhesive or cement. The front or upper end of the housing 32 is formed with a clearance opening 80 which is sufficiently large to provide clearance for the oscillatory movement of the shaft 54 as well as the deflection permitted by the movement of carrier 64. Because of the amount of movement of the shaft 54 in the area of the opening 80, it would be difficult to

20 provide a tight seal on the shaft 54 at that point. Accordingly, the interior mechanism of the appliance 20 is sealed against the entrance of moisture at a point close to the pivot point of lever 54 by a gasket 82 which is clamped between the bearing support 48 and an annular shoulder 83 formed on the interior of the tapered housing member 34.

 The gasket 82 is a molded rubber part having a thick outer rim 82a which is gripped between the bearing support 48 and the housing member 34 at shoulder 83, an intermediate thin-walled connecting portion 82b, and an axially elongated hub portion 82c which engages the shaft 54a and is received within a reduced diameter portion 84, as best shown in Fig. 4.

The gasket 82 is sufficiently resilient in the area of the intermediate connecting portion 82b to permit limited axial and pivotal movement of the shaft 54 in the bearing 62. The gasket 82 thus forms with the lower two thirds of the cylindrical housing member 34 and the cap member 36 an enclosure for a sealed chamber 85 within which the motor 40 and the battery 38 are positioned.

The upper portion of the housing member 34 extending from the gasket 82 to the end opening 80 forms a protective shroud or covering for the otherwise exposed end of the shaft 54. In addition, the outermost end of the housing member 34 is formed with an upstanding flange 86 which extends into an opening 87 formed in supporting shank 88 of the skin treating implement 26. As is evident from the showing in Figs. 2 and 12 of the drawings, the overlapping relationship between the shank 88 and the flange 86 provide an arrangement in which liquid is essentially prevented from entering into the opening 80 because of the tortuous path it must follow to accomplish such entry. Any liquid soap or cream which runs down the shank 88 of the implement 26 tends to run off the bottom of the shank onto the power handle 22 and has no tendency to move inwardly over the flange 86 and into the interior of the housing member 34. This provides a type of baffling which maintains the forward third of the housing 32 reasonably free of liquids thereby placing little demand on the sealing functions provided by the gasket 82.

The outer end of the shaft 54 is formed with a flatted portion 90 and circumferential groove 91. The flatted portion 90 cooperated with a correspondingly shaped opening or recess in the implement 26 to key the implement to a selected position when it is assembled to the power handle 22 whereby the bristles 30 face in a particular radial direction with respect to shaft 54. The circumferential groove 91 cooperates with deflectable nibs 92 formed on the implement 26 to detachably retain the

implement 26 assembled to the shaft 54. This provides an arrangement where the implement 26 may be readily assembled to or disassembled from the shaft 54 and whereby it will always be assembled so that the bristles 30 will be facing in a proper direction so that forces on the shaft 54 will actuate the switch 74.

For the purpose of restraining the shaft 54 during the mounting or dismounting of implements 26, a shaft restraining member 95 is provided in the forward end of the housing 32. The tapered housing member 34 is formed with an opening 96 which is aligned with a larger opening 97 formed at the opposite walls thereof. The openings 96 and 97 are designed to receive and support the shaft restraining member 95, as is best shown in Figs. 10 and 11. The member 95 is formed with an enlarged actuating button 98 which is exposed at the front of the handle 22 and a smaller holding button 99 exposed at the back of the handle 22. The central portion of the restraining member 95 is formed with a large clearance opening 100 through which the shaft 54 extends. In addition, there are detent projections 101 on the member 95 which cooperate with the walls of the housing member 34 to hold the button in either of the two positions shown in Figs. 10 and 11.

When it is desired to apply or remove an implement 26 from the power handle 22, the holding button 99 is depressed forcing the restraining member 95 to the position shown in Fig. 11. In this position, the shaft 54 abuts against the side of the clearance opening 100 and is restrained from moving in a direction which would close the switch 74 and energize the motor 40. Thus, implements may be applied to and removed from the shaft 54 without actuating the switch 74 as long as the restraining member 95 is in the position shown in Fig. 11. When it is desired to use the appliance 20 in treating the skin, the actuating button 98 is pushed rearwardly displacing the member 95 to the position shown

in Fig. 10. In this position, the hole 100 provides sufficient clearance for the shaft 54 to be deflected to a position in which the switch 74 is closed thereby energizing the motor 40. In addition, the hole 100 provides sufficient lateral clearance so that the shaft portion 54a may move in a plane perpendicular to the direction of movement of the member 95 so as to cause the implement 26 to move in its orbital path. It should also be noted that the member may be displaced from its holding position as shown in Fig. 11 to the operating position as shown in Fig. 10 by merely applying sufficient force on shaft 54 to overcome the action of detent projections 101. In some instances, this approach may be more convenient than displacing member 95 by pushing actuating button 98.

It should be readily appreciated that as the lever 54 moves axially and pivots about the bearing 62, the forward portion 54a of the lever 54 pivots sufficiently to produce the three sixteenths lateral movement discussed above in connection with the orbit of the implement 26. The motor speed and reduction produced in the gear member 52 is such that the shaft 54 in one constructed embodiment oscillates or defines the orbital movement of the implement 26 at the rate of 1800 times per minute. Because of the speed and extent of this oscillation, it is desirable to have the forward portion 54a of the lever 54 enclosed within the housing member 34 so that it will not be in a position to strike or bruise sensitive areas of the face and head when the bristles 30 of the implement 26 are being applied to the face, neck, etc. In addition, by having the housing 22 made in an elongated form and extending all the way to the shank portion 88 of the implement 26, the user is given more latitude and freedom in the manner in which the power handle 22 is gripped when applying the implement 26 to the skin of the body. This advantage is, of course, extremely important since there are some instances when reaching a remote portion of the back that one may desire to hold the power handle 22 adjacent the

cap member 36 while when delicately cleaning a portion of the face, between the nose and eyes for instance, the handle 22 may be held closely adjacent the implement mounting end of the power handle 22 so as to more accurately direct and control the location of the bristles 30.

In Fig. 16, there is shown an alternative embodiment of the skin treating or conditioning implement 26 designated as a massage implement 105. The implement 105 is similar to the implement 26 in that it has an elliptical back 106 and a shank 107 which is provided with means identical to those on implement 26 for receiving the end of shaft 54 and connecting the implement 105 thereto. The face of the implement 105 is formed with a recess 108 which occupies essentially the same area as the tufts or bristles 30 in the implement 26. Within the recess 108, there is mounted a hollow blow-molded polyethylene plastic container 109 which is filled with water or any other freezable liquid which would be liquid at room temperature and easily frozen in a household freezer. In enclosing relationship with the container 109 is a drawn aluminum cup 110 which is adhesively secured at its edges 111 to the walls of the recess 108. The other surface of the cup 110 is smooth and polished so that it may be applied to the face and skin without causing any scratching or irritation.

The implement 105 is intended to be placed in a freezing compartment prior to use so that the water enclosed in the polyethylene container 109 is completely frozen. Then, upon removing the implement 105 from the freezer and applying it to the face while driven by the power handle 22, the implement 105 provides a stimulating facial treatment by virtue of the heat transfer which occurs from the face through the aluminum cup 110 to the container 109 with its frozen contents. This type of treatment is recommended to close the skin pores during various types of beauty treatment. The elliptical, orbital movement of the massage implement 105 increases the effectiveness of the cold treatment or conditioning of the

skin. For simple massaging without heat or cold treatment, a third implement has been provided having the same shape as implement 105 but having a rubber cup rather than aluminum cup 110.

To permit the power handle 22 to be completely sealed against the entrance of moisture, charging means for recharging the battery 85 have been employed which avoid the necessity for having any contacts or conductors extending through the walls of the power handle 22. These charging means involve the use of an induction coupling between an external charging circuit 113 enclosed in the charging stand 24 and an internal charging circuit 115 sealed within the power handle 22. The internal charging circuit 115 includes a secondary coil 116 of a charging transformer 117. The charging transformer 117 also includes a primary coil 118 which is positioned in the charging stand 24. As is best shown in Figs. 2 and 13, the secondary coil 116 is made up of a bobbin or core 119 of permeable material having its axis coextensive with the axis of the power handle 22 and having windings 120 positioned thereon. The core or bobbin 119 comprises a cup-shaped upper member 119a which is formed of a magnetically permeable material and is secured to a lower circular wall 119b of the bobbin by a magnetically permeable hub 119c. The cup-shaped member 119a is formed with side walls 119d which are snugly received against the inside walls of the cap member 36. The upper edges of the side walls 119d engage a plastic spider 122 which in turn engages a retainer 121 and the motor 40. Both the spider 122 and retainer 121, which are best shown in Figs. 2 and 3, position the motor against lateral displacement and also retain the parts in their relative axial positions. The retainer 121 includes three upwardly projecting legs 121a which are formed with barbs 121b. These barbs 121b dig into the side walls of housing member 34 and retain the motor and battery assembly therein during assembly of cap member 36. Between the spider member 122 and

the upper wall 119a of the bobbin 119, there is located a rectifier 123 which is connected in circuit with the secondary coil 116 in the manner shown in the schematic drawing of Fig. 14.

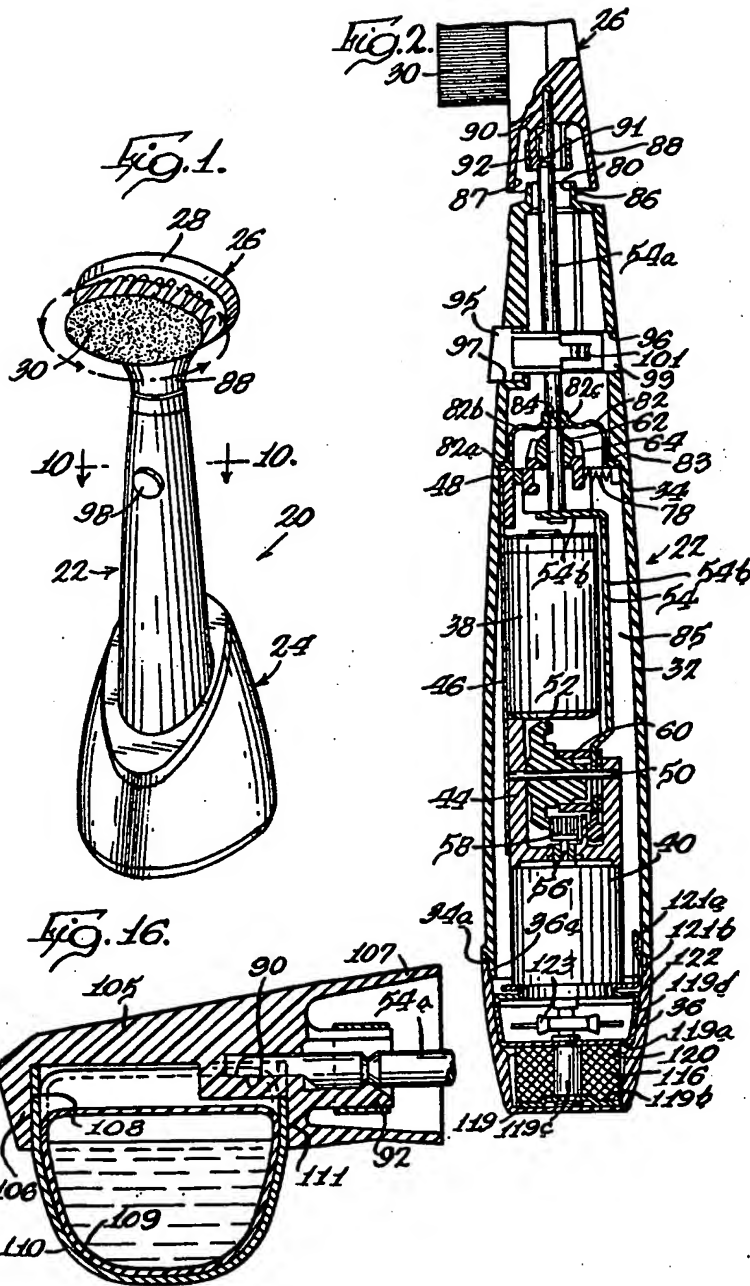
The external charging circuit 113 consists of a power cord 124 and the above mentioned primary coil 118 to which the cord is connected. The coil 118 is completely encapsulated in plastic to minimize shock hazards in connection with the use of the appliance 20. The encapsulated primary coil 118 is completely enclosed within a magnetic flux conducting enclosure 125 which is formed by two interfitting cup-shaped members 126 and 127 made of a magnetically permeable material, such as cold rolled steel. The lowermost of these two cup-shaped members, designated as by reference numeral 127, has a flat bottom wall 127a and a narrow upstanding peripheral side wall 127b. Received within the side walls 127b in overlapping relationship are the downwardly extending side walls 126a of the cup-shaped member 126. The member 126 is formed with a large opening 126b at the center thereof defined by upstanding flange 126c. The flange 126c is positioned to closely receive the cap member 36 on the power handle 22 as the power handle is rested in the charging stand 24. The primary coil 118 also has a central opening 118a which received the cap member 36, as is best shown in Fig. 13.

When the power handle 22 is in the charging position in the stand 24, as shown in Fig. 13, the cap member 36 rests within the enclosure 125 with the bottom thereof against the center portion of the cup-shaped member 127. This places the primary coil 118 and the secondary coil 116 in a nested relationship to provide the maximum coupling of magnetic flux between the two coils of the transformer 117. The cap member 36 is made of minimum wall thickness in the area between the lower wall 119b of the core 119 and the cup-shaped member 127 which makes up part of the enclosure for the primary coil 118. In addition, the wall thickness

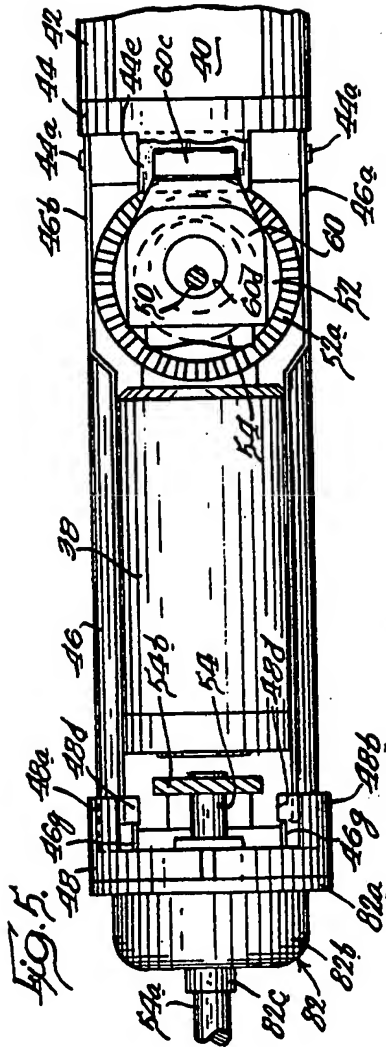
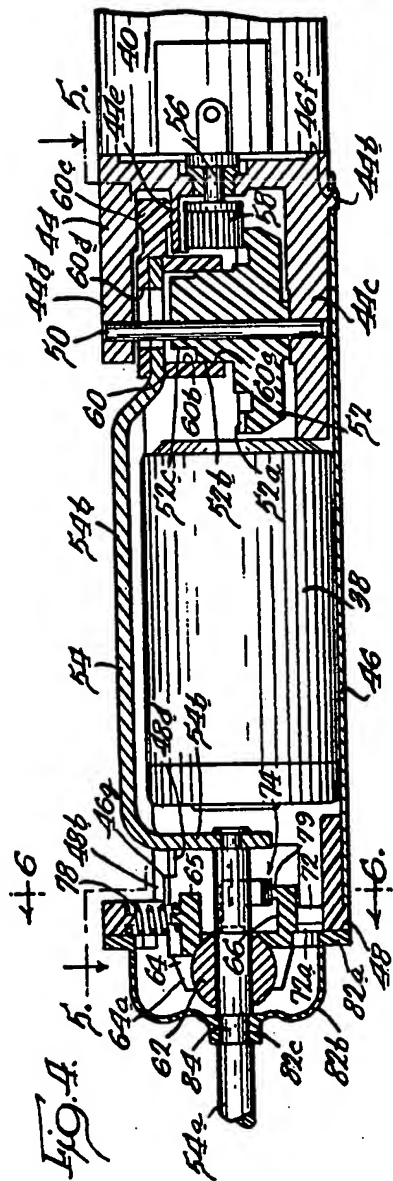
of the cap member 36 is at a minimum in the area of the upstanding wall 119d of the core 119 and the adjacent wall 126c on the upper cup-shaped member 126 of the coil enclosure 125. This arrangement minimizes the reluctance in the gaps between the metallic flux conducting members associated with the primary and secondary coils of the transformer 117. As a consequence, there is good coupling between the primary coil 118 and secondary coil 116. Thus, the charging of the battery 38 is accomplished by merely inserting the power handle 22 into the charging stand 24 where the primary and secondary of transformer 117 will be inductively coupled to supply a charging current in the internal charging circuit 115. The rectifier 123 provides a half wave charging current to the battery 38.

The housing portion of the charging stand 24 consists merely of two plastic molded parts, an upper housing member 24a, and a lower housing member 24b which are suitably secured together by assembly screws. In the assembled position, the upper housing member 24a has a downwardly directed wall 24c which engages the coil enclosure 125 and clamps it against the lower housing member 24b. This provides a structurally simple and attractive charging stand which supports and cradles the power handle 22 and positions it so that the internal charging circuit 115 is inductively coupled to the external charging circuit 113 in order that the battery 38 may be charged.

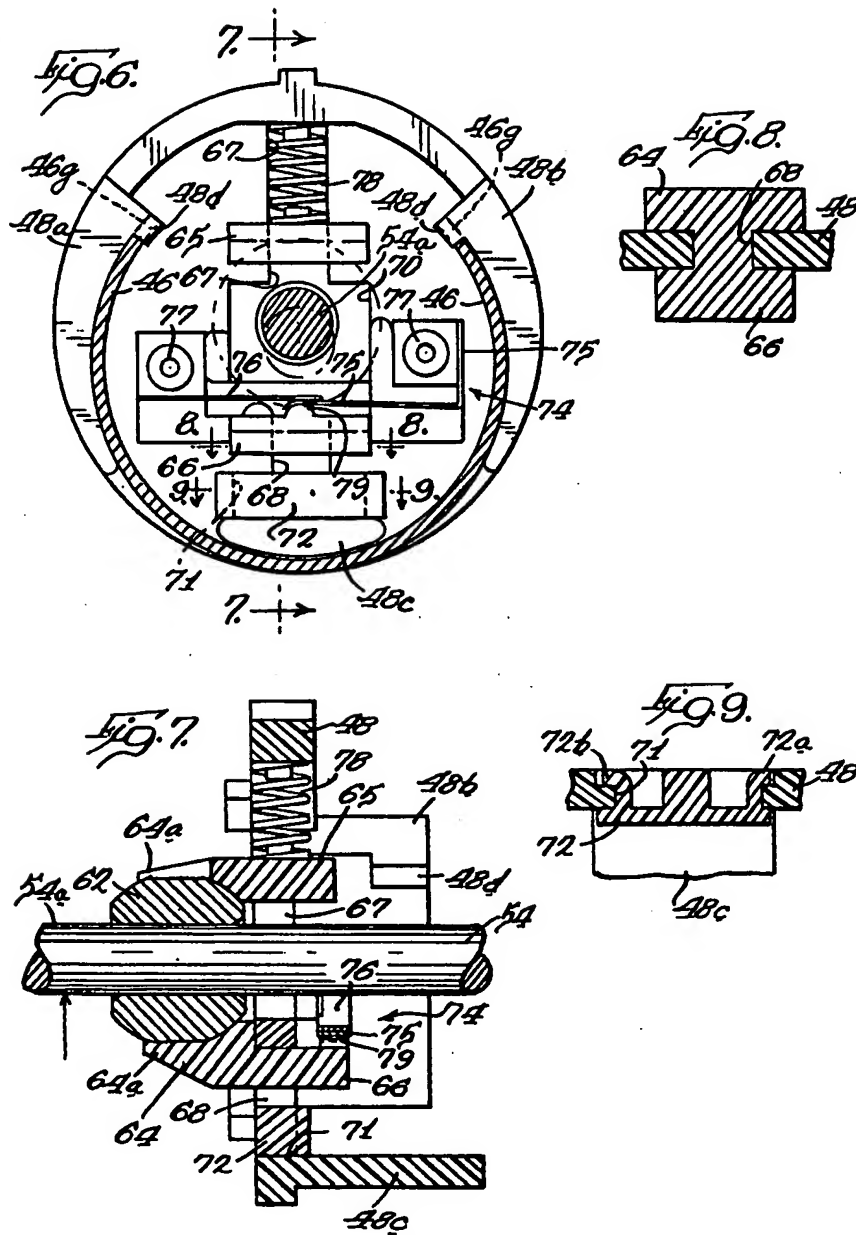
While there has been shown and described several embodiments of the present invention, it will be understood that changes and modifications may occur to those skilled in the art and it is, therefore, contemplated by the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the present invention.



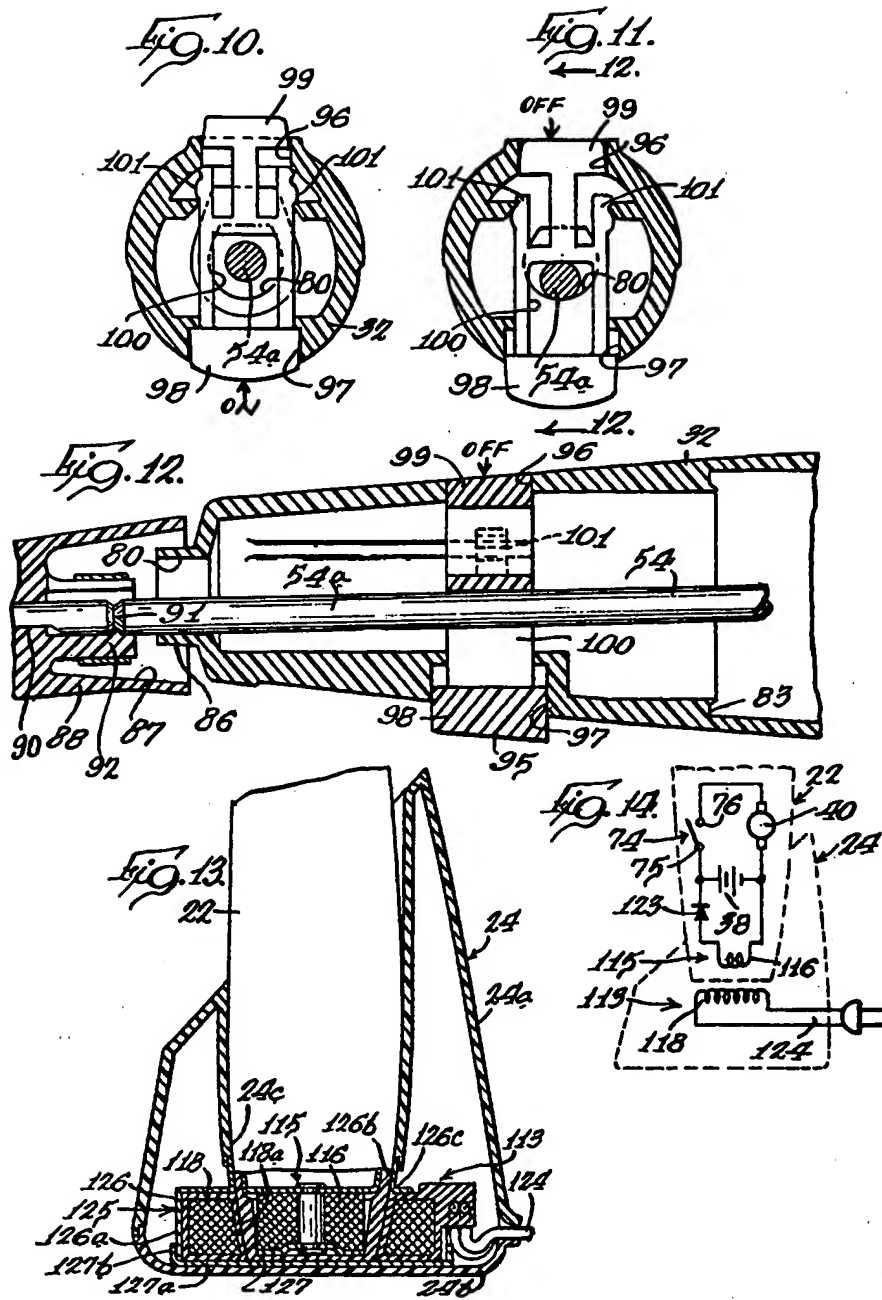
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